

# Incorporating Multiple Intelligence into Electronic Teaching Material in Supports of Usability Aspect

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## ABSTRACT

This paper presents a part of an ongoing study on incorporating the Multiple Intelligence into learning materials for children. This study believes that incorporating the Multiple Intelligence theory into learning materials is able to add more values towards the usability aspects of learning materials. In accordance, this paper aims at describing an attempt in designing a learning material that incorporates the Multiple Intelligence. In particular, the aims of the paper are (1) to suggest on how the elements of Multiple Intelligence could be incorporated into learning materials and (2) to outline the design and development of a sample of learning material that incorporates the Multiple Intelligence. User-centered design (UCD) approach is used as part of the methods in the design process, which involves three stages: (1) requirement gathering, (2) prototype development, and (3) user testing. This study involves children and teachers at kindergartens. As the results, an initial design of the learning material that incorporates the Multiple Intelligence is obtained and discussed in this paper at length.

**Keywords:** Electronic teaching material; multiple intelligence; user-centered design

## I. INTRODUCTION

This study is proposed to assist teachers at pre-schools in their teaching and learning activities. In relation, children are exposed to technologies at home, so when they are in school, they are more attracted to technology-enhanced learning activities (Halimah, Norhayati, Nor Azan, Tengku Mohd, Mohamad Yusoff, & Munir, 2000). This requires pre-schools to provide eLM for their teachers in supports of children's needs (Jones & Jo, 1998). Inline with that, many eLM in the form of courseware are available in the market, and some of them come with textbooks. However, the courseware is developed without studying the needs of teaching and instructional strategies. It can also be observed that children use the courseware on their own (Elsom-Cook, 2001), which in a way supports active learning (Faridah Hanim & Halimah, 2008). Unfortunately, the roles of teacher

in this type of courseware are less, because the courseware are developed for students' self-paced learning (Regan & Sheppard, 1996).

There is a need for supporting teaching and learning in classroom, beyond the self-paced approach. The teaching materials should include various activities, as teachers can do with the conventional textbooks. This type of teaching materials require teachers to operate in classroom. To be more specific, teacher can use the courseware as the instructor for the specific lesson, and children learn from and with the courseware (CTGV, 1993). In this case, the teachers' role is more on operating the teaching materials, and control the children in the classroom. In short, teachers' roles will focus more on social interaction in the classroom learning. Hence, the teaching materials should be friendly and interesting to most students. In response to this, the theory of Multiple Intelligence should be considered. It emphasizes that people are intelligent at different aspects: Verbal-linguistic intelligence, Mathematical-logical intelligence, Visual-spatial intelligence, Intrapersonal intelligence, Bodily-kinesthetic intelligence, Interpersonal, Naturalist intelligence, and Musical-rhythmic intelligence.

In response to the discussions in the previous paragraphs, Ariffin (2011) studied the guidelines of teaching materials for use in the pre-schools, which has been named EliteKids. The guidelines are detailed in Table 1.

**Table 1. Guidelines for EliteKids**

<b>Content</b>	<ul style="list-style-type: none"><li>• Following a standard syllabus.</li><li>• Consist of a few chunks of topics, including exercise or quiz.</li><li>• Simple and map children's existing knowledge.</li><li>• Each topic is short.</li><li>• Arranged according to thematic, increasing level of complexity, sequences of process, and the like.</li><li>• Include elements within children's mental model.</li></ul>
<b>Activities</b>	<ul style="list-style-type: none"><li>• Listen – allow children to listen to narration</li></ul>

	<ul style="list-style-type: none"> <li>• Read – encourage children to read the texts on screen</li> <li>• Witness / observe – Invite children to witness the characters in the learning material</li> <li>• Speak – invite children to speak together, such as singing and count</li> <li>• Move – encourage children to move their body, such as clap their hands, and nod their heads</li> </ul>
<b>Media elements</b>	
<b>a. Text</b>	<ul style="list-style-type: none"> <li>• Use large fonts – such as 18-points</li> <li>• Make sure the difference between the background and foreground is obvious</li> <li>• Make sure the fonts are clear, use sans serif</li> <li>• The fonts must be simple, use wide character-fonts such as Bookman Old Style</li> <li>• Make sure there is no mistake</li> </ul>
<b>b. Audio</b>	<ul style="list-style-type: none"> <li>• Pronunciation must be clear, slowly, and right with emphasis, tone, and stress</li> <li>• Obvious difference between the background audio, audio alert, and the content</li> </ul>
<b>c. Visual (graphic, animation, images, video, etc.)</b>	<ul style="list-style-type: none"> <li>• Good to be repetitive</li> <li>• User can control the audio</li> </ul>
	<ul style="list-style-type: none"> <li>• Use of multiple colors</li> <li>• Use only appropriate animation</li> <li>• Make sure the visual elements are standard</li> <li>• All graphics must be clear</li> <li>• Provide multiple different characters</li> <li>• Use suitable metaphors for children</li> </ul>
<b>Interactivity</b>	<ul style="list-style-type: none"> <li>• Maintain the standard</li> <li>• Provide sign post</li> <li>• Provide audio alert</li> <li>• Provide visual alert</li> <li>• It has to be minimal</li> <li>• Encourage the use of mouse or touch screen</li> <li>• Buttons must be obvious</li> <li>• Use clear instructions</li> <li>• Avoid hierarchy</li> </ul>
<b>Language</b>	<ul style="list-style-type: none"> <li>• Use simple sentence structure</li> <li>• Use short sentences</li> <li>• Good to repeat</li> <li>• Provided in written and audio forms</li> </ul>

The guidelines in Table 1 were gathered from the users in the context in the study, i.e. children and teachers at pre-school. They map with

instructional criteria, which collects theories of famous persons such as Gardner, Merril, and Rogers. In EliteKids, children's learning ability is emphasized more than making it merely for fun. Hence, the instructional elements are important.

The content is essential; it should always be identical with the syllabus provided by the accredited body. This is important to ensure that the children when learn with EliteKids, learn similar with those learn with printed books. With this kind of teaching material, the contents could be chunk into smaller parts, and arranged according to certain themes, sequences, or level of complexity. Also, relate the content with children's existing knowledge when the learning contents progress. This makes children engaged into the learning contents.

The multiple intelligence part involves in the methods for learning, particularly listen (verbal – linguistic – intrapersonal), read (verbal – linguistic), speak (interpersonal), witness (intrapersonal – spatial), and move (interpersonal – musical – bodily-kinaesthetic). This aspect should be incorporated in EliteKids in response to the various styles of learning among children, which allows every child learns. The use of various media elements is important. This reflects the multiple intelligences, in which some children tend towards learning with text, some with animation, and some with movement. Hence, the developers have to be creative in designing the EliteKids. The differences between the contents and other elements such as audio and visual alerts, and background music or song must be clear so that the children are not confused. Language and interactivity must be simple, because children have little experience in both. Their vocabularies and experience in interaction are limited. Hence, everything should be obvious and within their existing knowledge.

Based on the guidelines, this paper outlines the design and development of EliteKids. The methods of designing and developing the EliteKids are described in the following.

## II. METHOD

This paper extends the works explained in (Ariffin, 2011), hence only the designing and development part is explained (as illustrated in Figure 1).

### A. Design and Development of EliteKids

The EliteKids has been designed and developed by involving the real users; i.e. the children and teachers at pre-schools; into the activities. This means that all artifacts are shown to the users for

their agreement. Referring to the diagram in Figure 1, this systematic process is called User-Centered Design (UCD).

In the design process, a few artifacts were produced. This study first decided on the content to be included in the EliteKids. English is selected for this study, because it is a language, which is practiced everywhere. At pre-school, children mostly learn English through simple words and about knowledge around them. In ensuring the content in the EliteKids is sufficient for children at pre-school, the syllabus provided by the ministry is taken as the basis. Accordingly, all contents in the EliteKids are based on the syllabus by the ministry.

Having obtained the content guidelines, as well as the design guidelines as listed in Table 1, the storyboard was developed, in which the samples are depicted in Figures 2 through 6.

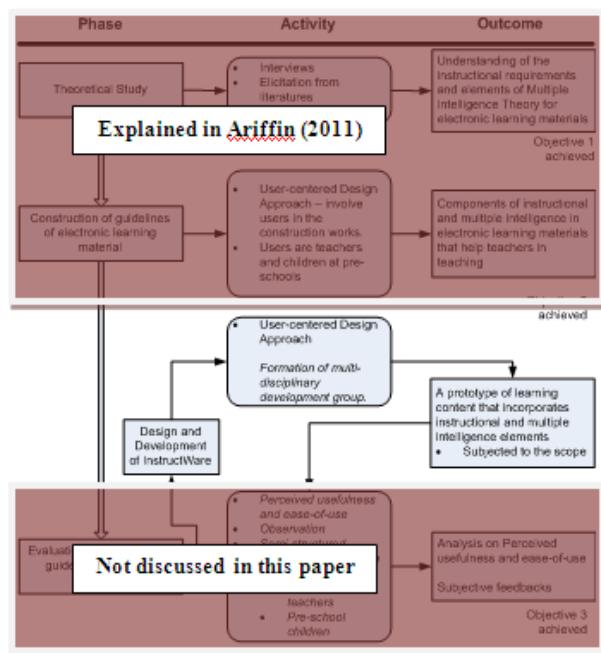


Figure 1. Activities and outcomes

In EliteKids, each unit provides four activities to users to select: listen, talk, read, and learn. The 'help' option provides the plan of activity for the users, meanwhile the 'lesson' option will take the users to the main page, in which the list of units are available. The buttons are indicated when they are being active. Figures 2 through 6 indicate different activities being carried out.

Besides, the reading activities can be carried out by either singing a song or listening to the sound (Figure 5), in which users could freely select. On top of that, the 'talking' and 'learning' activities

provides users with question-and-answer and practice activities as seen in Figures 4 and 6.

Based on the storyboard, the EliteKids was developed. This study decided to distribute the EliteKids in CD, hence developing it as a standalone application is sufficient. Accordingly, Flash was utilized for composing the scenes. Earlier, the audio was prepared first, using dubbing process in adobe Premierre. Finally the EliteKids has been realized, in which the following subsection describes its attributes.

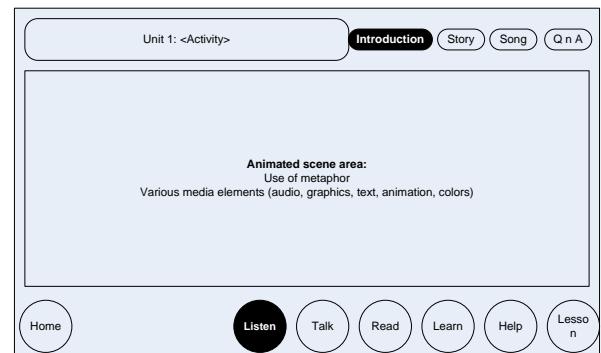


Figure 2. Storyboard – listening activity: introduction

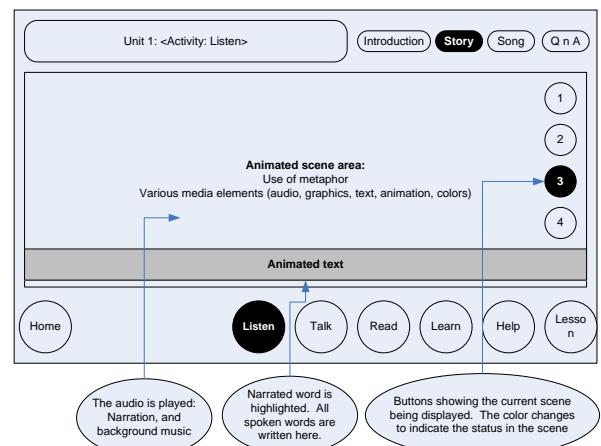


Figure 3. Storyboard – listening activity: story

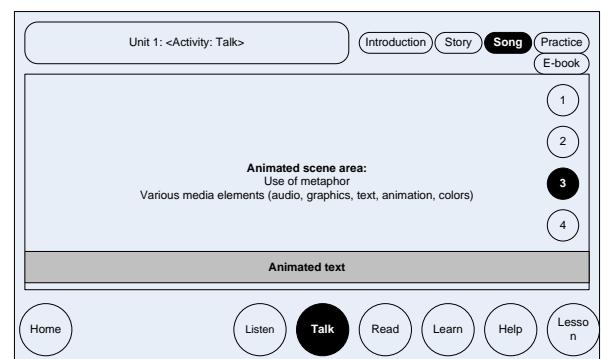


Figure 4. Storyboard – talking activity: singing together

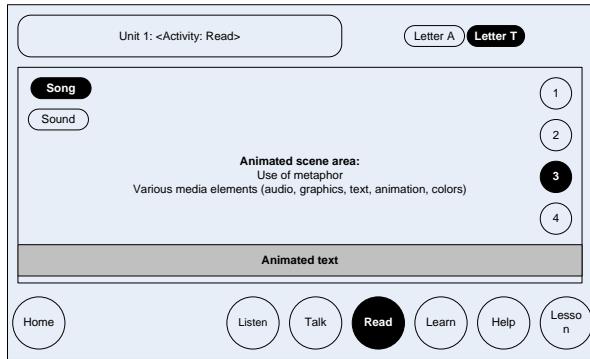


Figure 5. Storyboard – reading activity: singing about ‘T’

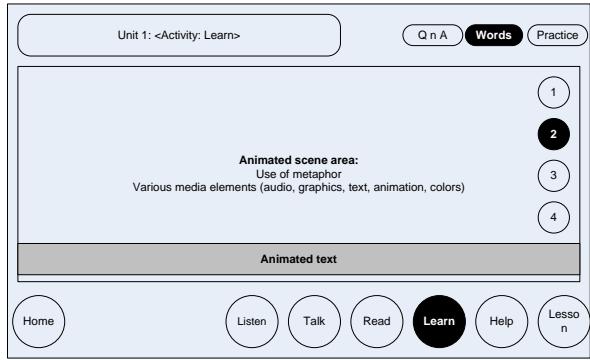


Figure 6. Storyboard – learning activity: in words

### B. The EliteKids

The main page of EliteKids is depicted in Figure 7. Users can select the unit from those available. If they click the ‘next’ button, the next units are available. All units are provided with their respective title, in which Unit 1 is about ‘myself’ is an example.



Figure 7. The main page

If the users click Unit 1, the page as shown in Figure 8 is displayed. By default, all units when visited starts with listening activity. It could be observed at its page title and the icons at the bottom as depicted in Figure 8. When the content is long, the status indicator is provided, in the form of

buttons as depicted in Figure 9, that user can click. Besides functioning as the status indicator, the buttons also enable users to revisit any intended scene.



Figure 8. Introduction section in unit 1

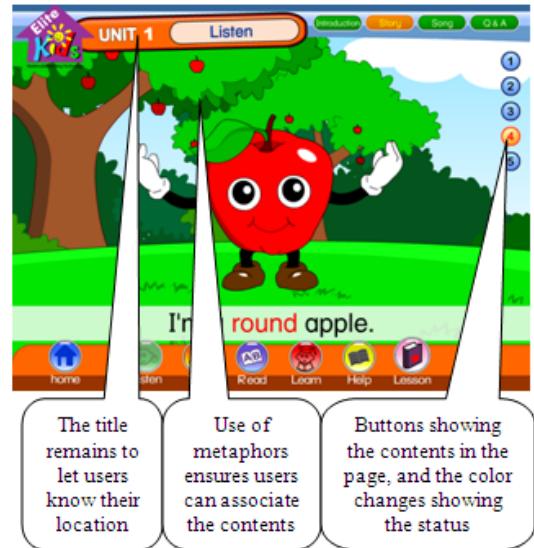


Figure 9. The story in listening activity

Besides listening to the story, users can sing together with the characters in the EliteKids as depicted in Figure 10. This provides motivational elements for people who tend to move (*bodily-kinesthetic intelligence*) and people who like music (*musical-rhythmic intelligence*). When singing together, users can read the provided narrated text. The pronunciation in EliteKids is well tested, making the users learn with correct pronunciation. Hence, at the same time, they are ensured pronouncing well (*verbal-linguistic intelligence*).

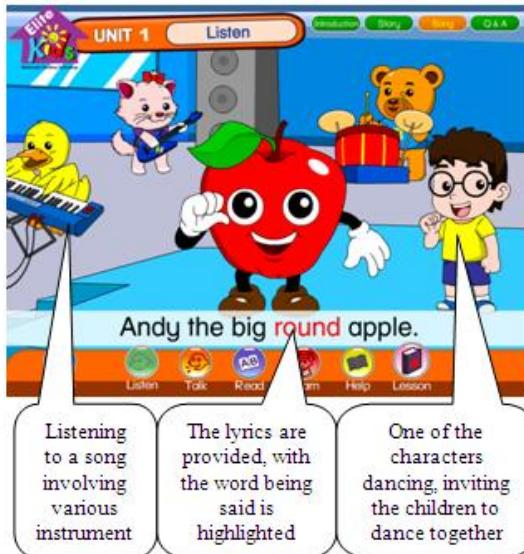


Figure 10. Singing a song in listening activity

The question-and-answer mode as depicted in Figure 11 ensures users involve in the activity. They can click any sentences to listen to the conversation again. In this kind of activity, users tend to answer the questions (*intrapersonal intelligence*), which stimulus their cognitive development.

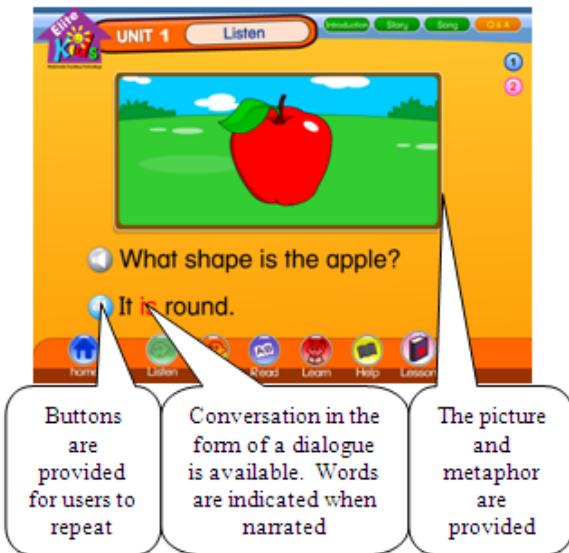


Figure 11. Dialogue in the form of question-n-answer

Then, when the users activate a new activity, the title is changed as seen in Figure 12, indicating the new activity. In talking activity, the practice and e-book sections are available.

Figure 13 shows that in the e-book, a conversation is provided, in which users can practice among themselves (*interpersonal intelligence*). The metaphor is EliteKids always ensures natural elements exists (*naturalist intelligence*). Furthermore, there are various scenes

utilized in EliteKids to support users' interest. In a way, it also stimulates cognitive development through the spaces (*visual-spatial intelligence*).



Figure 12. Storytelling in talking activity



Figure 13. Storyboard – learning activity: in words

### III. RESULT

The previous section illustrates that the EliteKids gathers all guidelines as listed in Table 1, and the recommendations in Multiple Intelligence. Then, the prototype was piloted with the users. It was aimed at evaluating how usable it is.

Thirty children from four pre-schools were involved in the testing. Besides, eight teachers who teach the children were also involved. In the test, they were let to experience the EliteKids. They

were observed while using the EliteKids. Then, they were interviewed.

#### A. Observation

From the observation, this study found that all users were very excited with the EliteKids. All children especially were singing along with the EliteKids when appropriate. When there is any dialogue, they involve by including themselves in the content in the EliteKids. Also, when necessary, the children involve their partners in the conversation. Both groups of users were happily practicing the sentences, clicking the repeat buttons to ensure they could copy the pronunciations. It was observed that they were trying to pronounce the words at their best.

#### B. Interview

The users were interview using unstructured format. All users were asked on how they think the EliteKids serves their needs. It was not surprised when they all agreed that the EliteKids helps them very much. Among the thirty children, there were different personalities. However, the feedbacks to the interview reveal that they were all encouraged by the EliteKids. On top of that, teachers were also happy with the model in EliteKids. It helps their job a lot, in which the EliteKids could teach both themselves and the children.

## IV. DISCUSSION

Children at pre-school are still very young. Their context is full of happiness. At the same time, their excitement to learn is high. Hence, understanding their needs in designing learning materials for them is necessary. Based on the guidelines in Table 1, this section summarizes the findings from both observation and interviews in Table 2.

**Table 2. Summary of findings**

<b>Content</b>	The teachers agree with the depth and breadth of the contents. The idea of chunking the contents into topics maps the current practice.  Children can associate the contents well with their existing knowledge.
<b>Activities</b>	All users enjoy the activities: listen, read, witness /observe, speak, and move. They clap their hands, twist their body, sing together, smile, read the text, listen to the audio, and speak to others.
<b>Text</b>	The font size is important, in terms of colors, size, style, and matching with the background.

<b>Audio</b>	In terms of the audio, it is also important. Normal children expect for the audio, but it should allow the children to control their volume. When it could be repeated, children like it even more.
<b>Visual</b>	The standardization is important. Animations should be minimized, provided when it is necessary. Otherwise, it overloads the children's memory
<b>Interactivity</b>	Standardization with signpost, audio and visual alerts, obvious buttons are very important.
<b>Language</b>	For all applications for children, the sentence structure must be simple with short sentences. Repetition is also good to support children learning, with the spoken words are written.

Besides the guidelines, the incorporation of Multiple Intelligence is also important. It ensures a large group of users enjoy learning with the EliteKids, as found in previous studies (Nurulnadwan, Nur-Hazwani, Eshak, & Ariffin, 2010, Nurulnadwan, Nur-Hazwani, & Ariffin, 2011).

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